

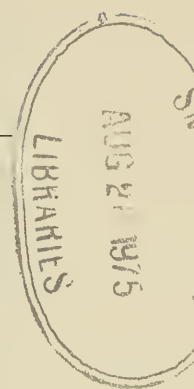
PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTON

THE IDENTITY OF *NANNARIA CONSERVATA*
CHAMBERLIN, WITH NOTES ON AN ABNORMAL
MALE AND DESCRIPTIONS OF TWO NEW
SPECIES OF *NANNARIA* FROM NORTH CAROLINA
(DIPLOPODA: POLYDESMIDA: XYSTODESMIDAE)

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The recent discovery of several different species of *Nannaria* in the mountains and western piedmont of North Carolina has compelled attention to the long-standing problem of *N. conservata*, whose identity has been uncertain since its original description by Chamberlin (1940). No illustrations were provided, and repeated attempts by myself to secure topotypical material from Duke Forest, Durham County, North Carolina, have been unsuccessful. This species is significant and important in the North Carolina milliped fauna because it is the easternmost *Nannaria* in the state and the only one authentically reported from a non-montane locality (Duke Forest is in the fall zone region of the eastern piedmont and over 100 miles from the Blue Ridge Front). In October 1973, I collected a male *Nannaria* from Rutherfordton, Rutherford County, in the western piedmont of the state, and could not be certain that this individual was different from Chamberlin's eastern piedmont species. Through the courtesy of Richard L. Hoffman, I have recently been able to examine the holotype of *conservata* and to determine that the Rutherford specimen is quite different indeed. This new species and one from Blowing Rock, Watauga County, North Carolina, are described herein along with comments and drawings of *conservata*, including an aberrant male with three pairs of



gonopods. This male and the holotypes of the new species are deposited in the invertebrate collection of the North Carolina State Museum (NCSM).

I am grateful to Richard L. Hoffman for the opportunity to examine the type specimen of *N. conservata* and for additional locality records of the species in North Carolina. Recent collections from Raleigh, including the abnormal, trigonopodal male, were contributed by Martha and John Cooper, N. C. State Museum. Figure 6 was prepared by Renaldo G. Kuhler, Museum staff artist; the other illustrations are the work of the author.

***Nannaria conservata* Chamberlin**

Figures 1-6

Nannaria conservata Chamberlin, 1940:56.

Type-specimen: Male holotype (R. V. Chamberlin collection, now being accessioned by U. S. National Museum) collected 12 November 1939 from Duke Forest, Durham County, North Carolina, N. B. Causey, leg.

The brief original description of this species lacks illustrations and did not mention the paramedian sternal knobs between the 4th pair of legs or the pointed spur at the base of the prefemoral process, although both are noted in the description of *N. minor*, the type species (Chamberlin, 1918). The sternal knobs are subconical and subequal in length to the width of the adjacent coxae (Fig. 1). Chamberlin (1940) did state in his description that the gonopods of *conservata* "conform closely in general form to those of *N. minor*," but as can be seen from the present illustrations (Figs. 2, 3) and that by Hoffman (1964) of *minor* (which was not originally illustrated either), the gonopods of the two species are quite different. Thus, the original description of *conservata* (Chamberlin, 1940) is confusing and does not adequately depict the characters of the species. The extremely short prefemoral process was noticed by Chamberlin, however, and it is clearly the diagnostic feature of *conservata*.

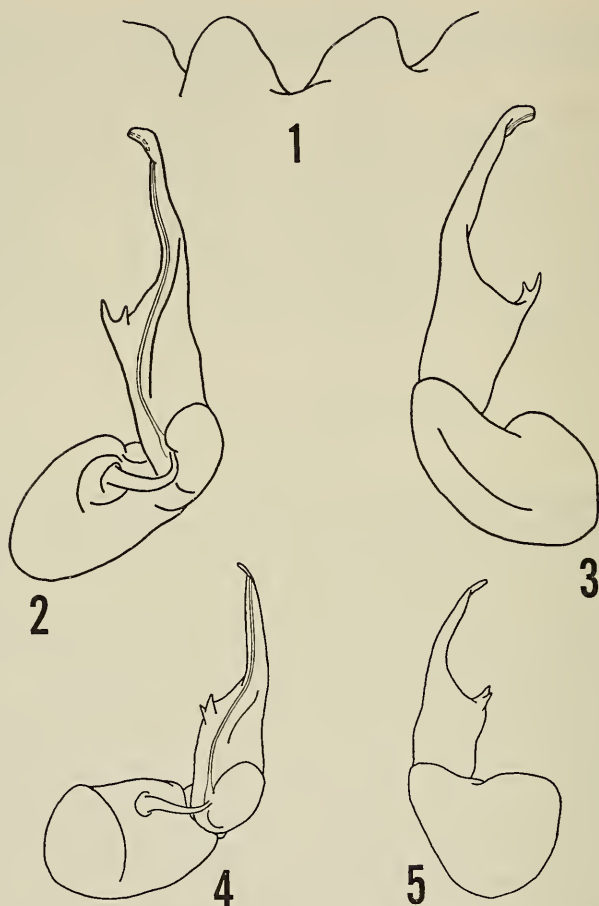
I have recently received fresh material of *conservata* from Raleigh, Wake Co., (9♂, 2♀) and submit the following observations to supplement Chamberlin's description. The species appears to be a small *Nannaria* and is considerably shorter in both length and width than the new species described later in this paper. Measurements in millimeters are given below; they were made with vernier-scale calipers with the specimens lying flat, straight, and compressed. Averages were not computed for females, since only two were available. The abnormal male, designated by an asterisk, is not included in the averages (NCSM 2829).

	Width	Length	W/L ratio
Males	3.1	16.9	18.3%
	3.0	15.8	19.0%
	3.1	16.1	19.3%
	2.8	14.4	19.4%
	*2.9	14.6	19.9%
	3.3	16.5	20.0%
	3.4	17.0	20.0%
	3.4	16.6	20.5%
	3.3	15.8	20.9%
Averages	3.2	16.1	19.7%
Females	3.7	18.2	20.3%
	3.3	15.5	21.3%

In color, *conservata* is olive-brown with a pink epiproct and paranota; some individuals have a darker base color, probably due to an earlier molt. A wide pink stripe extends across the anterior edge of the collum, and, on the lighter individuals, a faint, narrow pink stripe is visible across the caudal half of each metatergum. The latter stripe is noticeably removed from the caudal edge, as opposed to most striped xystodesmids I have seen. Ventrally, they are uniformly white in color. All the specimens are fragile and easily broken or crushed.

The abnormal male possesses a condition which, to my knowledge, has not been reported before in any order of diplopods. It has a triple complement of gonopods, all located in fully formed apertures at the anterior position of segments 5, 7 (the normal location), and 9 (Fig. 6). No other external character is replicated, and the individual is normal in color pattern, although somewhat below the male average in physical dimensions (see table above). Due to the first "accessory" gonopods on segment 5, the paramedian sternal knobs of that segment are missing. The sternal spines begin as usual on the first post-gonopodal segment, but in this case it is segment 10 instead of 8. The gonopods on segments 5 and 7 are normal, but the pair on segment 9 is severely reduced in overall size, and both the telopodite and prefemoral process are incompletely developed (Figs. 4, 5). The regularity of the pattern is impressive, that segments 5, 7, and 9 are involved rather than an irregular pattern such as 5, 7, and 10 or 6, 7, and 9, etc. Unfortunately, this male was preserved before its condition was detected, and mating experiments with normal females could not be attempted, although it might be expected to be sterile. A thorough search of this locality revealed no further abnormal millipeds.

In the absence of a definitive explanation for this phenomenon, it seems best to label this male a "developmental accident," caused by



FIGS. 1-5. *Nannaria conservata* Chamberlin, 1940. 1-3, holotype: 1, profile of paramedian sternal knobs between 4th pair of legs, caudal view; 2, left gonopod, medial view; 3, left gonopod, lateral view. 4-5, left gonopod of 9th segment of abnormal male (NCSM 2829): 4, medial view; 5, lateral view.

unknown genetic and/or environmental factors, and to monitor the site in future years to see if another abnormal individual appears.

Distribution: *Nannaria conservata* is known only from the "triangle" (Raleigh-Durham-Chapel Hill) region and nearby localities in eastern piedmont North Carolina. In addition to the type-locality, known distribution records include the following: Franklin Co., 1.5 miles SW

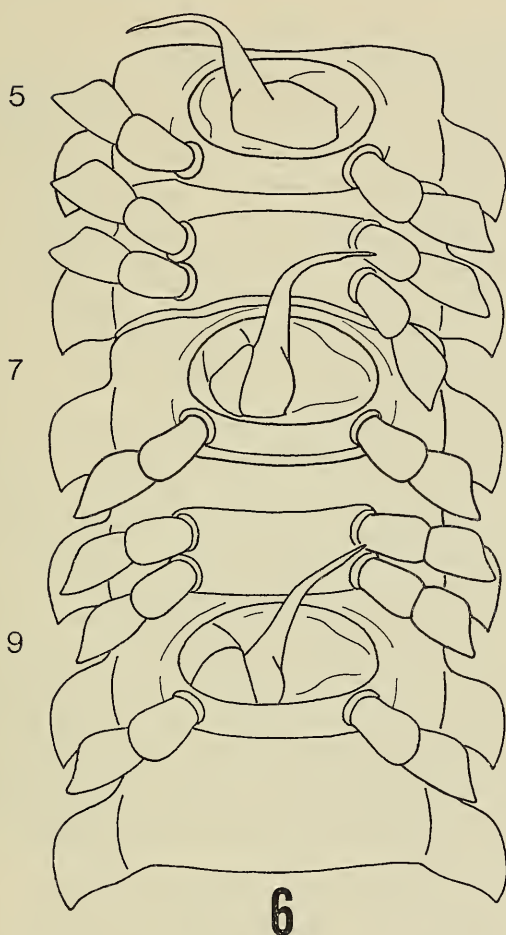


FIG. 6. Ventral view of segments 5-9 of abnormal, trigonopodal male from Raleigh (NCSM 2829). The right gonopod of seg. 5 and the left of segs. 7 and 9 were removed prior to illustration, and the remaining gonopods have been slightly displaced medially.

Pilot, 1 ♂ in collection of R. L. Hoffman, 2 May 1959, L. Hubricht, leg. Wake Co., Raleigh, several males and females in the Chamberlin collection, collected on two unspecified dates by unspecified collectors; and 9 ♂ (one abnormal with three pairs of gonopods), 2 ♀, NCSM 2825, 2828 and 2829, 29-31 January 1975, M. R. and J. E. Cooper, leg. I have also collected several juveniles of *Nannaria*, both sexes, from Johnston Co.,

11.1 miles SW Smithfield. These are probably *conservata*, but no adults have been encountered at this locality.

Ecology: No habitat descriptions have been published for *conservata*, and the type locality, Duke Forest, includes a variety of biotopes, some within the city limits of Durham. The 1975 material from Raleigh was taken from the yard of a residence in the northern part of the city. The species was concentrated primarily next to the house under a hedge and leaf clippings and was also found at the base of several trees under thick layers of pine needles. These were relatively dry locations; the milliped was not encountered in the more moist spots in the yard. The juveniles from Johnston Co. were found on sandy soil under a thin layer of leaves, in a small tract of hardwoods. This is a rather unusual habitat for xystodesmids, but *Apheloria* and *Sigmoria* were also collected there as was *Ptyotulus*, a parajulid which I frequently find in sandy habitats.

Remarks: Wray (1967) included the type locality for *conservata* in his list of millipeds of North Carolina, and Brimley (1938) and Wray listed *N. minor* as having been collected in Raleigh in December and February (no year given). Since *minor* is known only from Carter Co., Tennessee, and Madison Co., North Carolina (Hoffman, 1964), these Raleigh records are undoubtedly incorrect. Additionally, there are no specimens of *minor* from Raleigh in the Chamberlin collection, but it does contain the previously mentioned specimens of *conservata*, collected on two different dates. The latter are probably what Brimley and Wray had in mind, and it seems likely that Brimley collected the millipeds and sent them to Chamberlin, who misidentified them as *minor*. The Raleigh collections of *conservata* in 1975 indicate that the species is present in the city during the winter months and further suggest that the published listings for Raleigh refer to this species and not to *minor*. Thus, *Nannaria conservata* is the only *Nannaria* so far known in the eastern piedmont region of North Carolina.

***Nannaria rutherfordensis*, new species**

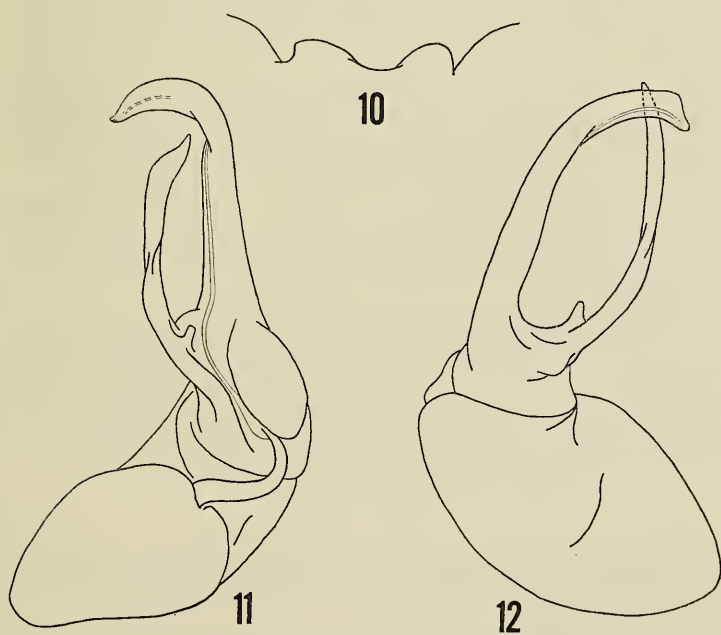
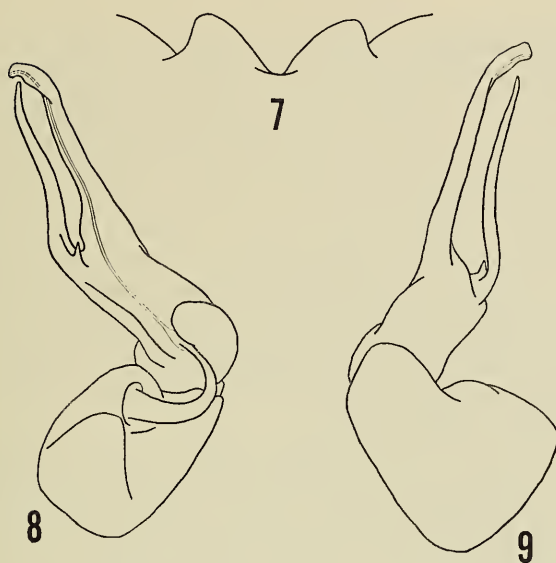
Figures 7–9

Type-specimen: Male holotype (NCSM 2053) collected by the author on 15 October 1973, in Rutherfordton, Rutherford County, North Caro-

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FIGS. 7–9. *Nannaria rutherfordensis*, n. sp. (holotype, NCSM 2053). 7, profile of paramedian sternal knobs between 4th pair of legs, caudal view; 8, left gonopod, medial view; 9, left gonopod, lateral view.

FIGS. 10–12. *Nannaria domestica*, n. sp. (holotype, NCSM 1007). 10, profile of paramedian sternal knobs between 4th pair of legs, caudal view; 11, left gonopod, medial view; 12, left gonopod, lateral view.



lina, along U. S. hwy. (Business) 74, 0.2 miles W U. S. hwy. (Bypass) 74. Female unknown.

Diagnosis: Characterized by the following combination of characters which does not occur in any other known species of the genus: pointed spur at base of prefemoral process; prefemoral process sigmoidally curved and uniformly tapering to pointed tip, slightly shorter than acropodite; acropodite apically truncate and undivided, sharply bent mediad distally.

Holotype: Length 22.9 mm, greatest width 4.7 mm, W/L ratio 20.5%. Color in life unknown; coloration of preserved specimen: metaterga brown, segments 1-6 lighter than others; all terga with narrow dark stripe along posterior edge; paranota white; collum with wide white stripe along anterior edge, connecting with paranota; epicranium continuous color with anterior (lighter) segments; genal apices white; antennae light brown, distal two segments darker; venter and legs white; sterna slightly darker.

Paramedian sternal knobs between 4th pair of legs subconical, subequal in length to width of adjacent coxae (Fig. 7); sternal spines beginning as faint blunt lobes on segment 7, larger from 8-17 and becoming sharply pointed on 18 and 19; prefemoral spines short through segment 9, longer at 10 and curving caudad, longest on 17; hypoproct broadly rounded; paraprocts with margins strongly thickened.

Gonopodal aperture broadly oval, edges slightly raised and thickened; gonopods (Figs. 8, 9) with pointed spur at base of prefemoral process; prefemoral process uniformly tapering and curving sigmoidally to pointed tip, slightly shorter than acropodite; acropodite bladelike, slightly wider at midlength, bending sharply mediad distally and overlapping near tip with acropodite of opposite gonopod, apex of acropodite blunt, truncate, not apically divided.

Ecology: The type specimen was collected from under leaves against a log in an urban patch of hardwoods, a few feet from the pavement (elevation approximately 1000 ft.).

Distribution: Known only from type-locality.

Remarks: The prefemoral spur distinguishes this species from *N. simplex* Hoffman, 1949, and the apically blunt, distally bent telopodite distinguishes it from *N. minor* Chamberlin, 1918, and *N. fowleri* Chamberlin, 1947. The long, sigmoidally curved prefemoral process distinguishes it from *conservata*, the other known piedmont species.

***Nannaria domestica*, new species**

Figures 10-12

Type-specimen: Male holotype (NCSM 1007) collected by the author on 16 October 1971, in Blowing Rock, Watauga County, North Carolina, from yard of residence on Goforth Road, 0.5 miles N. U. S. hwy. 321. Female unknown.

Diagnosis: Characterized by the strongly twisted prefemoral process with blunt spur at base; acropodite without apical division.

Holotype: Length 24.5 mm, greatest width 4.6 mm, W/L ratio 18.6%. Color in life unknown; coloration of preserved specimen: metaterga dark brown, with narrow dark stripe along posterior edge of segments 5–18; paranota white; collum with wide white stripe along anterior edge, connecting with paranota; epicranium brown, frons and clypeus lighter; antennae brown; venter white.

Paramedian sternal knobs between 4th pair of legs small, inconspicuous, much shorter in length than width of adjacent coxae (Fig. 10); sternal spines beginning at posterior legs of segment 7, becoming spinelike on 8 and extending through 18; hypoproct with three weak lobes, one medial and one on either side; paraprocts strongly margined.

Gonopodal aperture broadly oval, edges slightly raised and thickened; gonopods (Figs. 11, 12) with blunt spur at base of prefemoral process; prefemoral process strongly twisted at midlength and curving sigmoidally posteromedial to pointed tip, shorter than acropodite; acropodite blade-like, curving strongly anteromedial distally and becoming progressively narrower to pointed tip, not apically divided.

Ecology: The type specimen was collected from under leaves along the edge of a paved driveway (elevation approximately 3600 ft.).

Distribution: Known only from type-locality.

Remarks: This species is very similar to *N. laminata* Hoffman, 1949. They both have twisted prefemoral processes, but *laminata* lacks the basal spur which is distinct on domestica.

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